ZAM – SERVIS s.r.o.

KŘIŠŤANOVA 1116/14, 702 00, OSTRAVA - PŘÍVOZ

User's manual

Continuous belt scale

KPV-02

Documentation number: 20815

This user's manual contains:

Instructions for assembly, installation, putting into operation, use, regulation, maintenance and service, disassembly, disposal and technical conditions

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User's manual:

This user's manual includes instructions for assembly, installation, putting into operation, use, regulation, maintenance and service, disassembly, disposal and technical conditions.

All employees involved in installation, putting into operation, operating, and maintenance and service must prove familiarity with these operating instructions. Retain this manual for further use.

Contents

Use....2
Description and function....2
Caution....4
Installation and assembly....5
Operating instructions....6
Maintenance....6
Repairs and spare parts....6
Delivery, transportation and storage....6
Appendices....6
Fire prevention, environmental issues, disposal, recycling....7
Manufacturer and service organization....7
Relevant standards, regulations and documents....7
Technical parameters and view....8

Use

- The KPV-02 belt weighing system is used to measure the output of the belt conveyor (weight flow) and calculates the total weight. The rate of material transfer is most often given in t/h or kg/s. The KPV-02 is designed for measuring the weight of extraction materials like coal, coke, gravel,… The weigh bridge and integrator are designed for heavy industry operations and for environments where the risk of methane explosion exists.

Description and function

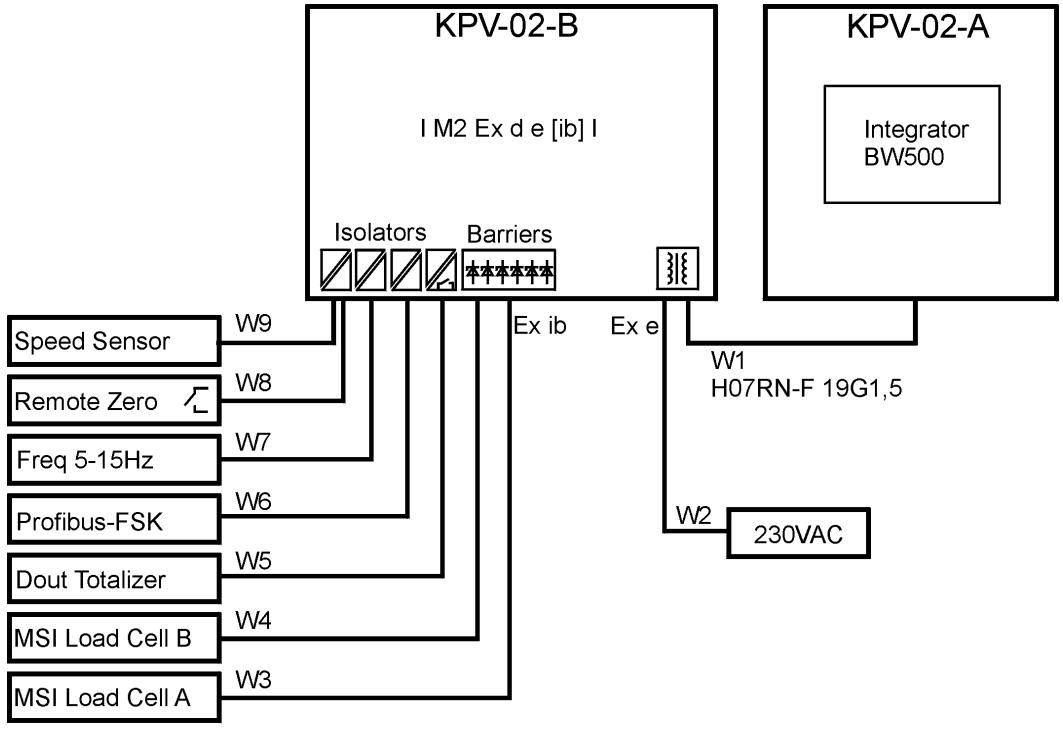
- The measuring system of the continuous belt scale consists of an MSI weigh bridge structure with a conveyor belt rolling on idlers and a BW500 integrator and other electronics in KPV-02-A and KPV-02-B cases. The MSI weigh bridge includes G4-TBSP strain gauges that detect the linear forces on the belt as m_l[kg/m]. Other input data includes the speed of the belt in [m/s] detected by a sensor (e.g. RBSS, MD-36, induction sensor, etc.), or a constant value can be applied. Using these two sources of data, the BW500 integrator calculates the rate of material transfer (or weight flow) Q_m[kg/s, t/h].

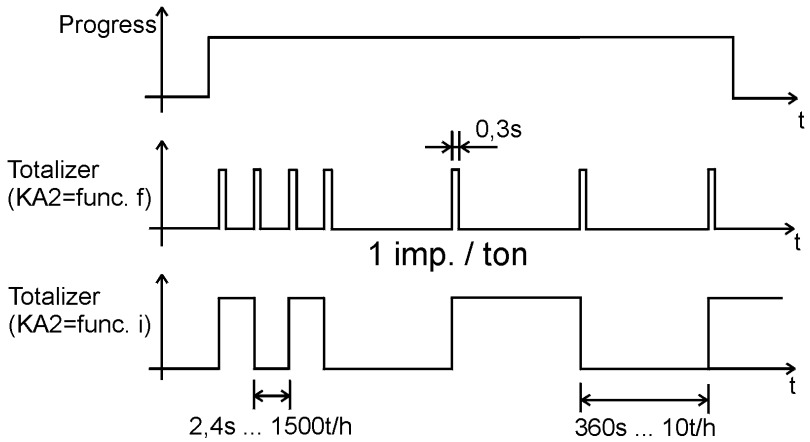
$$Q_m[kg/s] = m_l[kg/m] \cdot v[m/s]$$

- The integrator display shows the rate of material transfer [kg/s, t/h], the speed of the belt [m/s], totalized weight (internal totalizer 1 and 2) [t, kg], or the linear forces on the belt [kg/m]. The rate, speed or forces applied on the belt can be sent with a frequency signal of 5-15Hz. The integrator can be programmed to limit the output to a specific amount of conveyed material (external totalizer 2). The integrator's parameters and measurements can be controlled through the Profibus communications interface.
- The KPV-02 electrical and electronic equipment are located in two mounted KPV-02-A and KPV-02-B casings with IP54 enclosure and I M2 Ex d e [ib] I explosion guard. The BW500 integrator is located in KPV-02-A, the other instruments and transducers in the Ex ib spark-proof KPV-02-B part. Both parts are connected by an H07RN-F 19G1,5 heavy-duty rubber-coated cable. Terminal housings are Ex e secure, containing Wago 264 and 281 screwless terminals and Stahl 8161/5 M20 and M40 plastic bushings. The cables for the strain gauges

can be connected through protective sleeves in a 21mm hole or through the M20 bushing. The G4-TBSP strain gauges of the MSI weigh bridge structure comply with Czech standard ČSN EN 60079-11 for basic equipment.

- KPV-02 is powered from the Ex e screwless terminals via switch and fuses to a transformer that provides galvanic isolation between the integrator and voltage power. The integrator powers the strain gauges via the Ex ib transducers. Signals from the strain gauges are fed back into the integrator via the Ex ib transducers. The detected speed and autozero switch are also connected to the integrator through an Ex ib isolating switch amplifier. The 4-20mA output signal from the integrator is transmitted via an Ex ib frequency signal of 5-15Hz. The RS485 interface of the the SmartLinx Profibus-DP communications module is transmitted to the Ex ib Profibus-FSK communications interface. The external totalizer 2 switches the KA2 relay, which switches the isolating KA1 relay, the contact for which is connected to the Ex ib terminals. The KPV-02 is factory set such that every ton triggers the relay with a short impulse of 0.3s. The KA2 relay function can be set up to switch at 1:1.





Block schematic of KPV-02 and unit of time for the totalizer output

The parameters of the totalizer for the BW500 integrator are set for P638-02=4 and P643-02=300ms

Caution

Installation, calibration, adjustment, and operation of the scale shall be carried out in accordance with the operating manual for the Siemens Milltronics BW500 integrator and the operating manual for the MSI weigh bridge structure.

The following values are set and monitored during the production of KPV-02:

P003	2 (2 load cells)
P004	2 (metric units)
P005	1 (design rate units t/h)
P008	**Date**
P009	**Time**
P011	***1500t/h (max. output of the belt, customer requirements)***
P014	***3.05m/s (max. speed of the belt, customer requirements)***
P015-01	***150.4 pulses/m (number of pulses of the RBSS speed sensor)***
P690-01	***1 (speed calculated using P015)***
P016	***140m (belt length, customer requirements)***
P017	***19.68kg/m (=3x8.2kg/1.25m test load 3x8.2kg, idler interval 1.25m)***
P018	Constant speed is set if terminals 17/18 are jumpered
P081	**1 (automatic scrolling display)**
P200-01	2 (output range 4-20mA analog signal 1)
P201-01	1 (rate, output of the belt in analog signal 1)
P204-01	0 (OFF, switching off averaging of analog signal 1)
P212-01	3,8mA (Output minimum value of analog signal 1)
P213-01	22mA (Output maximum value of analog signal 1)
P638-02	4 (1x the external totalizer 2)
P643-02	300ms (duration of external totalizer contact closure 2)
P647	**3 (totalizer 1 and 2 display)**

Values other than the factory settings of the BW500 are marked in bold.
Values dependent on a specific application are marked in bold and italics.

These parameters are set for the U9 current-frequency transducer:

ADV.SET	NO
IN.TYPE	CURR
I.RANGE	4-20
UNIT	Hz
DEC.P	11.11
DISP.LO	5.00
DISP.HI	15.00
OU.UN	Hz
F.MIN	5.000 Hz
F.MAX	15.00 Hz
CUT.OFF	0 mHz
O.TYPE	50%D
OUT.ERR	YES
f.ERR	0mHz
RESP	0.4

Installation and assembly

1. Choose a location for installing the KPV-02 with a minimum of vibration, mechanical stress, disturbances in electromagnetic field, heat and humidity. Before use check that the enclosure, cables and cable bushings are in good condition. Unused bushings must be replaced with original seals. Carry out the installation, calibration, adjustments and operation of the scale according to the operating manual for the Siemens Milltronics BW500 integrator and the operating manual for the MSI weigh bridge structure.

2. Installation in spaces where the risk of explosion exists must comply with this instruction manual, local operating regulations, Czech standards ČSN EN 50394-1, ČSN EN 60079-0, ČSN EN 60079-1, ČSN EN 60079-7, ČSN EN 60079-11, ČSN EN 60079-25 and other existing regulations and norms.

3. The KPV-02-A and KPV-02-B casing is mounted in the vertical position on a firm foundation with 4 M8 screws. The cover is grounded to safeguard against injury from electrical current in compliance with Czech standards ČSN 332000–4–41 for connecting to main equipotential bonding. Use the screw clamp on the side of the mounted enclosure for connecting the grounding lead and leads for equipotential bonding.

4. Connect the KPV-02-A casing to Ex e terminals X2-1...19 with the KPV-02-B casing to Ex e terminals X1-1...19 using the H07RN-F 19G1,5 heavy-duty rubber-coated cable through the M40 bushing. Connect the 230V/50Hz power supply to Ex e terminals X1-21...23 through the M20 bushing and/or the M40. The average length of the cable in the M20 bushing can be 6-13mm. The average length of the cable in the M40 bushing can be 17-28mm. The diameter of the connecting leads can be 0.5-4mm^2.

5. The KPV-02 can only be connected to the MSI weigh bridge structure using the G4-TBSP strain gauges. Connect the strain gauges to Ex ib terminals X2-24...30 (in protective sleeves through the 21mm hole, in cables through the M20 bushings).
   Connect the input for the ext. totalizer 2 to Ex ib terminals X2-31,32 through M20 bushing.
   Connect Profibus-FSK communicaton equ. to Ex ib terminals X2-33,34 through M20 bushing.
   Connect the input for the 5-15Hz signal to Ex ib terminals X2-35,36 through the M20 bushing.
   Connect the autozero switch to Ex ib terminals X2-37,38 through the M20 bushing.
   Connect the speed sensor to Ex ib terminals X2-39,40 through the M20 bushing.
   The average length of the cable in the M20 bushing can be 6-13mm. The diameter of the connecting leads can be 0.5-2.5mm^2. Separate cabels must be used for each strain gauge and other equipment.

6. The bushings must be properly tightened so that the cabels are adeqautely clamped and sealed. During installation and use, safeguards must be taken to ensure that the cables remain free of applied force. The leads may not be left idle. A distance of at least 50 mm must be maintained between sparkproof terminals and terminals not similarly protected. After assembly is complete, all portions of the enclosure must be properly set in place and tightened. Pay careful attention when handling the enclosures so that none of the inner components are damaged.

7. For closing up the equipment, wipe the contact surface free of dust and apply a layer of grease (Mogul K3). The contact surface forming the explosion-proof seam must always be undamaged, greased and free of surface modifications. A spring washer must be used under every screw for the explosion-proof enclosure. The M10 screws for the lid of the enclosure are tightened with a prescribed torque of 8-10 Nm and the M5 screws with a torque of 1-2 Nm.

Operating instructions

- The KPV-02 is operator-free after connecting the power supply. Operation of the continuous belt scale depends on the application used to run it. Installation, calibration, adjustment and operation of the scale is carried out in accordance with the operating instructions for the Siemens Milltronics BW500 integrator and the operating instructions for the MSI weigh bridge structure.

Maintenance

- Keep the surface free of dust and impurities using a dry cloth or brush, perform further cleaning of the surface using a damp cloth and ordinary or alcohol-based detergents. Check the condition of the enclosure and the tightness of the casing. If any dust or dampness gets inside the casing, clean and dry the instrument. Greasing should be done 1 to 2 times every two years using Mogul K3 lubricant (or a corresponding lubricant). Remove the old grease with a rag before applying the new lubricant. Check to ensure the contact surfaces for individual parts are always clean and intact.

Repairs and spare parts

- The manufacturer provides for all repairs and spare parts with the exception of changing these fuses:
- F1,F2 GT 520 150 ceramic tube fuse, 5x20mm, T500mA, 250V, breaking capacity 1500A (Omega, Enika)

Delivery, transportation and storage

- KPV-02 Continuous belt scale with BW500 integrator
- KPV-02-A and KPV-02-B connecting casings:
  - H07RN-F 19G1,5 cable, length as per order, max. 10m, standard 5m

- Delivery includes:
- This instruction manual
- Appendices, see appendices
- Declaration of compliance
- Certification of quality and completeness of the product
  - Actual product
- Any possible vibration and jolts must be kept to a minimum while transporting all parts. Store in dry spaces at a temperature between 0 and 40°C in one thermal layer.

Appendices

- Operating instructions for the Siemens Milltronics BW500 integrator
- Operating instructions for the current/frequency PRelectronics PR4222 transducer
- Operating instructions for the Bartec BTM 02/S communications transducer

Fire prevention, environmental issues, disposal, recycling

- Do not expose to flames, combustion creates hazardous materials.
- Proper use during operation will not cause harmful effects to surroundings or the environment.
- Upon expiration of the product's service life, return for disposal. The address is given in the document.

- Electrical and electronic equipment may not be disposed of as ordinary community waste after the end of service life. The product must be handed over to an appropriate collection point for the proper processing, regeneration and recycling of electrical and electronic equipment.
- For more detailed information about collecting points and recycling this product, ask your local authorities, companies working with the disposal of community waste in your location or the sales office where you bought the product.

Manufacturer and service organization

ZAM - SERVIS s.r.o. Křišťanova 1116/14, 702 00 Ostrava - Přívoz, tel: 596 135 422, zam@zam.cz

Relevant standards, regulations and documents

LVD, EMC:

ČSN 33 2000–4–41	Electro-technical regulations – Electrical equipment – Part 4: Safety – Chapter 41: Protection against injury from electrical current
ČSN EN 60529	Degree of protection from the casing (enclosure - IP code)
ČSN EN 60 439-1	Switchgears Part 1: Standardized and tested and partially standardized and tested switchboard

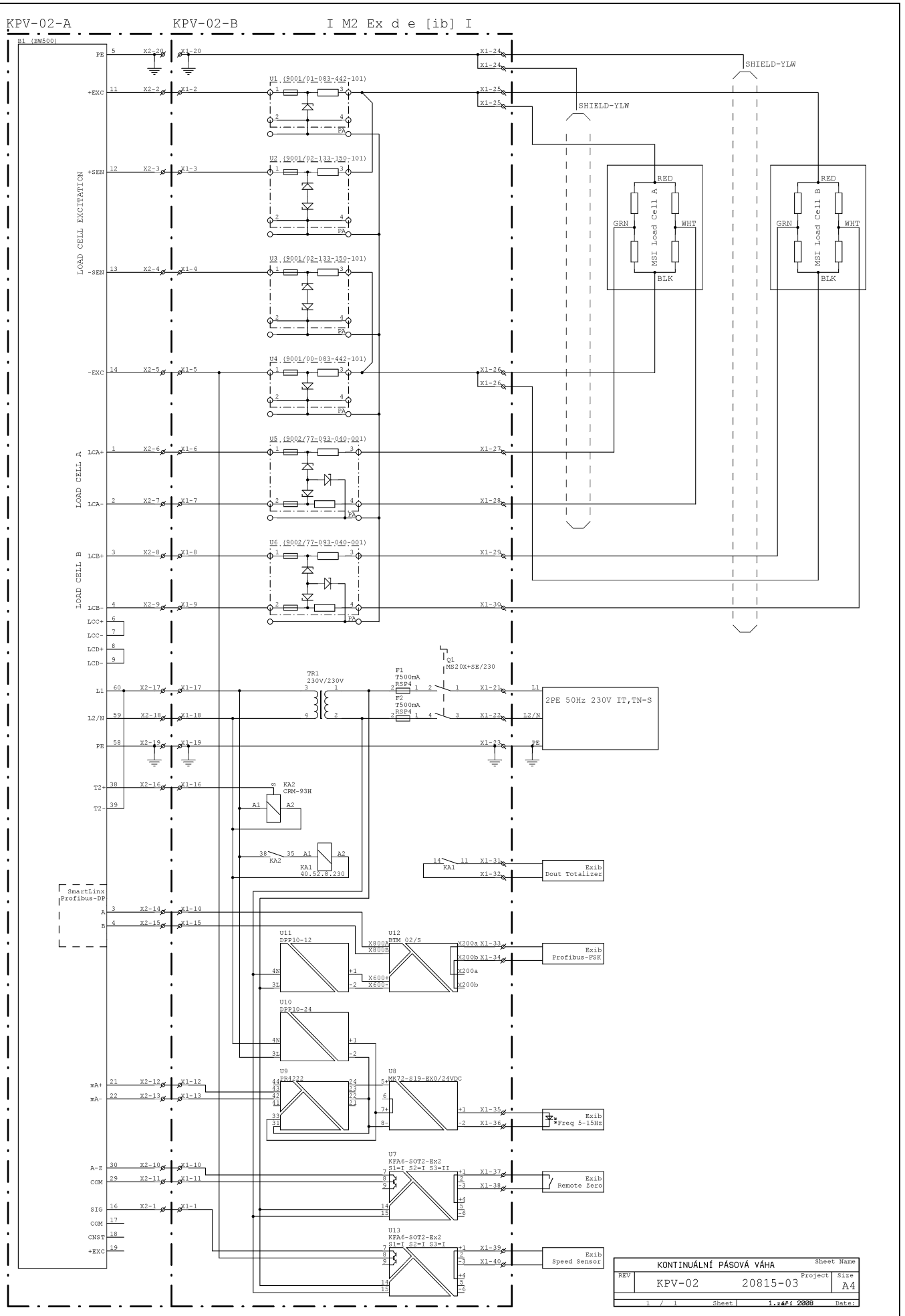
ATEX:

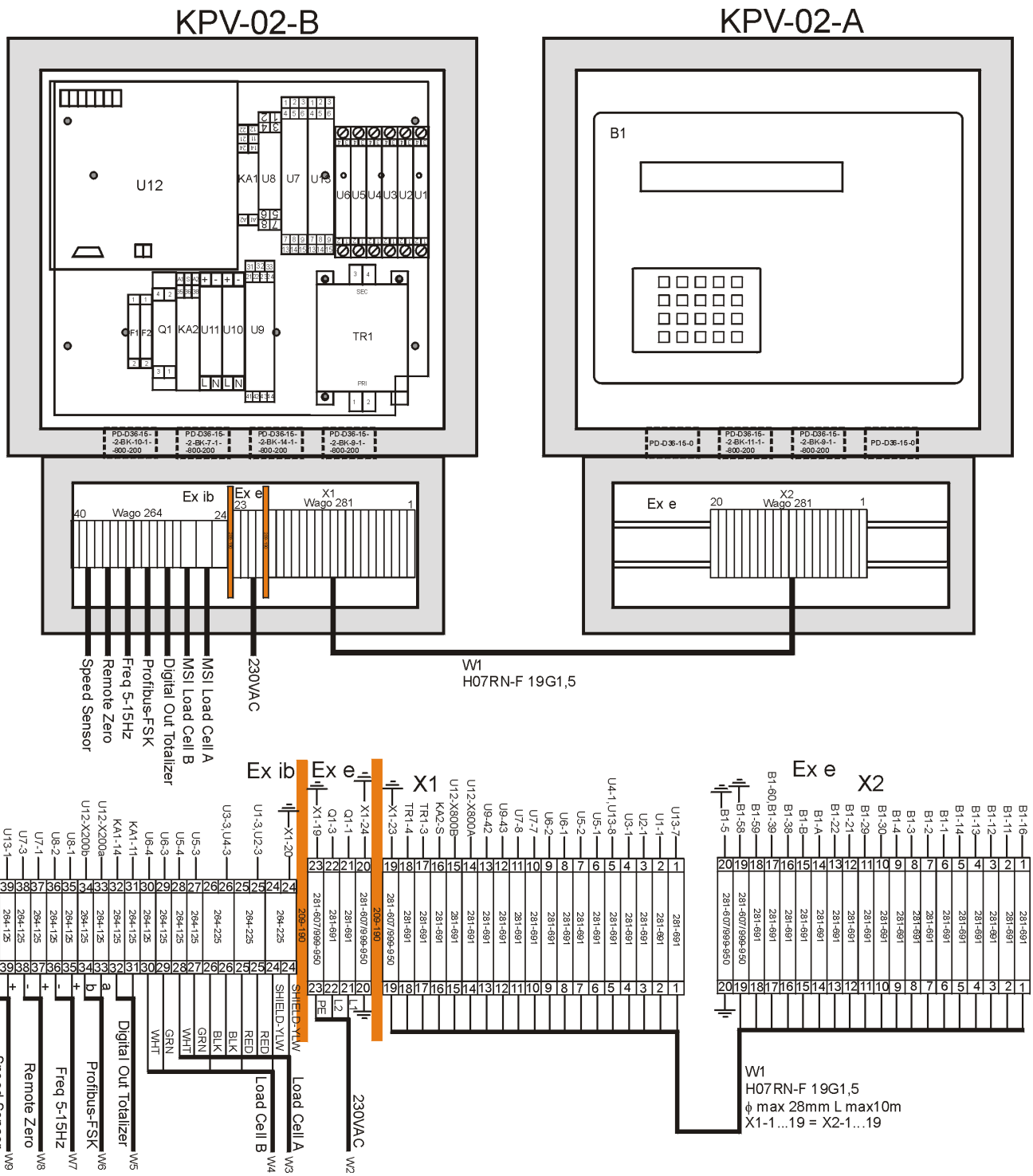
ČSN EN 50394-1	Electrical equipment for an environment where the danger of explosion exists – Group I – Spark-proof systems
ČSN EN 60079-0	Electrical equipment for combustible atmosphere - Part 0: General requirements
ČSN EN 60079-1	Electrical equipment for combustible atmosphere - Part 1: Mounted casing "d"
ČSN EN 60079-7	Electrical equipment for combustible atmosphere - Part 7: "e" secured
ČSN EN 60079-11	Combustible atmospheres - Part 11: Safeguarding equipment with "i" spark-proofing
ČSN EN 60079-25	Electrical equipment for combustible atmosphere - Part 25: Spark-proof systems
ČSN EN 1127-1	Combustible environment – Prevention and protection against explosion - Part 1: Basic definitions and methodology
ČSN EN 1127-2	Combustible environment - Prevention and protection against explosion - Part 2: Basic concepts and methods for mines

Technical parameters and view

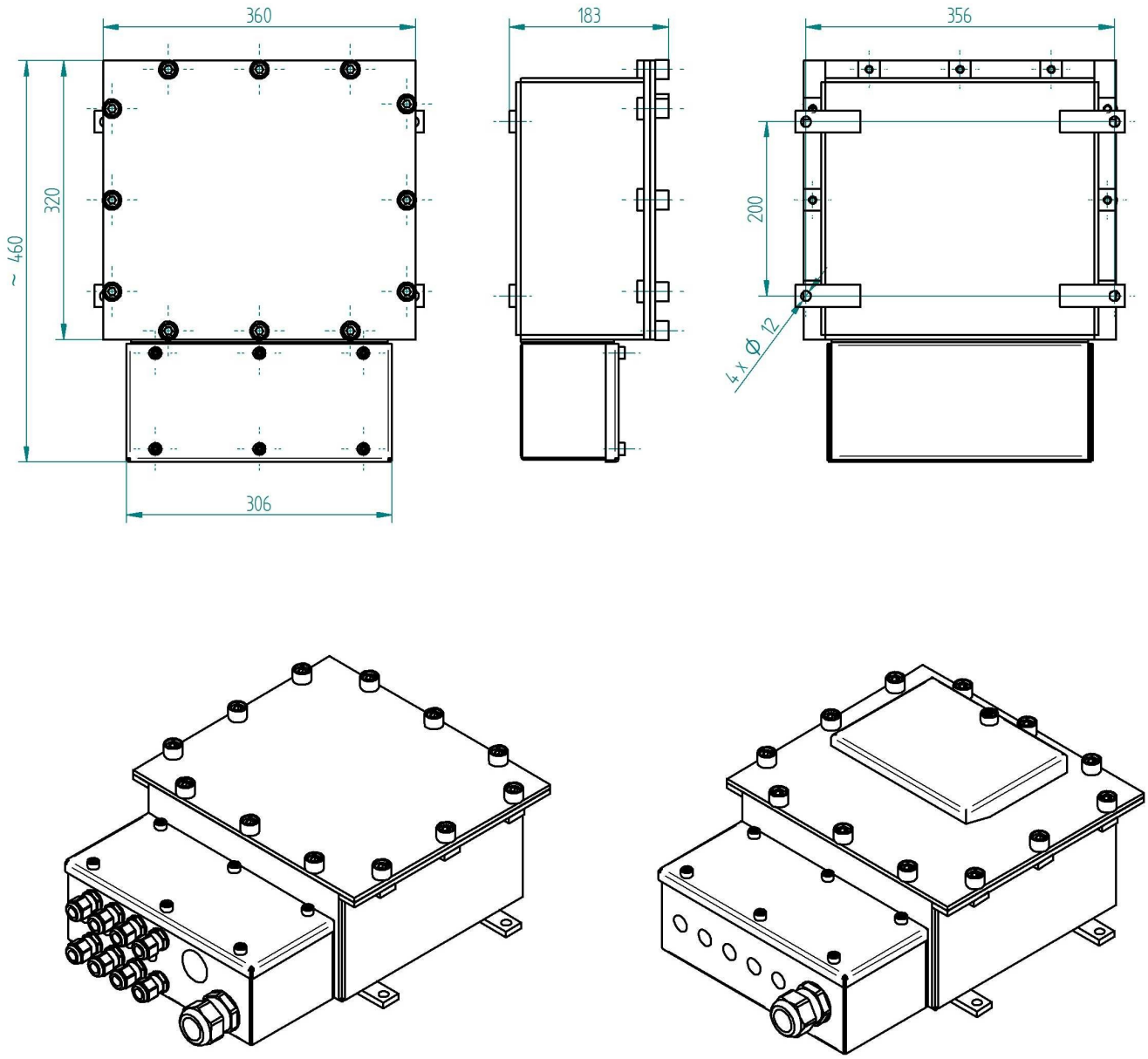
Nominal power for terminals X1-21...23	**230VAC, 50Hz, network TN-S or IT**
Nominal input power	30VA
Nominal current of the fuses	0.5A
Diameter of the jumpers for terminals X1-1...23, X2-1...20	0.5mm^2 to 4mm^2
Diameter of the leads for terminals X1-24...40	0.5mm^2 to 2.5mm^2
Diameter of the cable in M20 bushing	6 to 13mm
Diameter of the cable in M40 bushing	17 to 28mm
Temperature range	0 to 40 °C
Relative humidity	Max. 95% without condensation
Enclosure	IP 54
Dimensions of one casing	380x510x205mm
Weight of one casing	40kg
Protection against explosion	**I M2 Ex d e [ib] I**
Spark-proof parameters	
U1, U4 barriers	
9001/01-083-442-101, U1 term. X1-25	Uo = 8,3V
9001/00-083-442-101, U4 term. X1-26	Io = 442mA
	Po = 917,2mW
	Lo = 0,5mH
	Co = 73µF
U2, U3 barriers	
9001/02-133-150-101, term. X1-25,26	Uo = 13,3V
	Io = 150mA
	Po = 498,8mW
	Lo = 7mH
	Co = 5,6µF
U5, U6 barriers	
9002/77-093-040-001, term. X1-27,28,29,30	Uo = 9,3V
	Io = 40mA
	Po = 0,09mW
	Lo = 87mH
	Co = 31µF

U7, U13 isolating switch amplifier	
KFA6-SOT2-Ex2, term. X1-37,38,39,40	Uo = 10,5V
	Io = 13mA
	Po = 34mW
	Lo = 730mH
	Co = 16,8µF
U8 spark-proof pulse source	
MK72-S19-EX0/24VDC, term. X1-35,36	Uo = 27,6V
	Io = 130,5mA
	Po = 1,32W
	Lo = 3mH
	Co = 205nF
U12 communications transducer	
BTM 02/S, term. X1-33,34	Uo = 8V
	Io = 420mA
	Po = 840mW
	Lo = 2mH
	Co = 1mF
	Ui = 8V
KA1 relay contact of totalizer	
40.52.8.230, term. X1-31,32	Ui = 48V
	Ii = 2A
	Ci = 0
	Li = 0


KPV-02-A
KPV-02-B
I M2 Ex d e [ib] I
B1 (BW500)
LOAD CELL EXCITATION
LOAD CELL A
LOAD CELL B
PE
+EXC
+SEN
-SEN
-EXC
LCA+
LCA-
LCB+
LCB-
LCC+
LCC-
LCD+
LCD-
L1
L2/N
T2+
T2-
mA+
mA-
A-Z
COM
SIG
CNST
SHIELD-YLW
RED
GRN
WHT
BLK
MSI Load Cell A
MSI Load Cell B
U1 (9001/01-083-442-101)
U2 (9001/02-133-150-101)
U3 (9001/02-133-150-101)
U4 (9001/00-083-442-101)
U5 (9002/77-093-040-001)
U6 (9002/77-093-040-001)
TR1
230V/230V
F1
T500mA
F2
T500mA
Q1
MS20X+SE/230
2PE 50Hz 230V IT,TN-S
KA2
CRM-93H
KA1
40.52.8.230
SmartLinx
Profibus-DP
U11
DPP10-12
U12
BTM 02/S
U10
DPP10-24
U9
PR4222
U8
MK72-S19-EX0/24VDC
U7
KFA6-SOT2-Ex2
S1=I S2=I S3=II
U13
KFA6-SOT2-Ex2
S1=I S2=I S3=I
Exib
Dout Totalizer
Exib
Profibus-PSK
Exib
Freq 5-15Hz
Exib
Remote Zero
Exib
Speed Sensor
KONTINUÁLNÍ PÁSOVÁ VÁHA
Sheet Name
REV
KPV-02
20815-03
Project
Size
A4
1 / 1
Sheet
1.září 2008
Date:



Inner workings and terminal box of the KPV-02



Mechanical dimensions and view of the KPV-02-B casing (left) and KPV-02-A (right)